

**"IT'S A HOBBY"**

Yes, a hobby for fun. Interest in home computing is spreading fast. I feel our club is doing a good job in supporting the individual experimenter get his or her system up and flying. There are a lot of obstacles, bugs, and technical tricky problems which can frustrate and discourage a person alone. By sharing our experience and exchanging tips we advance the state of the art and make low cost home computing possible for more folks.

Bring your beast in for a demo! Can it sing or play games? What tricks does it know? Let's have a look at it.

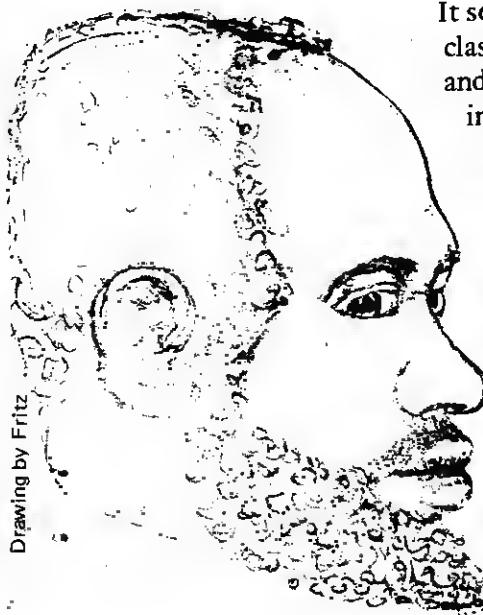
Thanks to Ray and Karen for demonstrating his 008A Microcomputer with audio cassette adapter at the May 14th meeting. Using an 8008 microprocessor, the 008A is available as a kit (\$375) from RGS Electronics 3650 Charles St. Suite K, Santa Clara, Ca. Recently Ray got Jerry's TVTypewriter I working nicely.

Thanks to Gordon for bringing and explaining his text editing system May 28th. The system's beauty is the ease with which one can look into 16 K of storage and find what's there to be re-arranged as you please. The only thing I missed in playing REVERSE on it were the bells congratulating me when I'd won. A computer game without bells is like a steam engine without a whistle!

A special thanks to Wayne for bringing the club a paper tape version of a Fortran IV cross assembler for the 8008 and PL/M on mag tape, and two listings of the resident 8080 and 8008 assemblers. The club now has a responsibility to use this software in a non-profit manner, which means no private or commercial deals. If you have a system large enough to house a copy of the mag tape and can make access available to the rest of the members, contact Gordon French.

Wayne also brought a TV terminal Intel developed two years ago as a demonstration unit. The unit uses a 4004 microprocessor and has both a character and a plot mode (5 x 7 dot square you can move around). Wayne hooked it up to a TV and tuned it in on the edge of channel 6. The current ROM gave us our choice of tic-tac-toe or tennis. We played both.

At the previous gathering Wayne had suggested using a shadow ROM for bootstrapping when you first turn on your computer. This time on request he drew a schematic on the greenboard, but I don't think many of the less technically oriented among us followed his explanation completely. Which brings me to a general observation: The club is quite a mixed group. We are composed of outright novices to top flight professionals and leaders in the industry. Many are somewhere inbetween. Only a few are strong in both hardware and software.



Wayne

It seems to me, we need classes or some more patient and detailed means of conveying information across an ignorance gap, and at the same time not bore the more experienced among us. I think our size is large enough now that after meeting as a whole from say 7 to 9 pm, we then break into three or four small groups for more educationally oriented discussions for an hour. Anyone have comments on this? Perhaps there is enough learning taking place as it is and any attempt to optimize it further will

upset the relaxed informality of the gatherings. Comments?

Thanks to John Draper for setting up a group library account for the club at Call Computer. Those who have accounts, have your number changed to a K-2?? number. If we have enough join, the club won't be charged the \$5.00 monthly base rate. (We also pay 63 cents per thousand characters on file permonth.) The intention is to have useful programs stored in the K-200 library file.

Thanks to Dan for testing the 2102's the group purchased from Solid State Music. Thanks to Lenny and Frank for setting up the auditorium for our use. Much thanks and appreciation to everyone for your time, energy, and spirit in making the club what it is.

The MITS MOBILE came to Rickey's Hyatt House in Palo Alto June 5th & 6th. The room was packed (150+) with amateurs and experimenters eager to find out about this new electronic toy. The evidence is overwhelming that people want computers, probably for self-entertainment and educational usage. Why did the Big Companies miss this market? They were busy selling overpriced machines to each other (and the government and military). They don't want to sell directly to the public. I'm all in favor of the splash MITS is having with the Altair because it will do three things: (1) force the awakening of other companies to the demand for low-cost computers for use in the home, which will mean competition, resulting in lower prices just as happened with the hand held calculator. (2) cause local computer clubs and hobby groups to form to fill the technical knowledge vacuum. (3) help demystify computers. Computers are not magic. And it is important for the general public to begin to understand the limits of these machines and that humans are responsible for the programming.

## DESIGN NOTES by

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The process leading from pen to press left the last paragraph of my discussion on the "SART" only marginally comprehensible (see Issue number three). To clear away any confusion the paragraph should have appeared as follows:

IC9 is the receiver clock, it operates at two frequencies: 16.8AUD when IC10, pin 5 is at logic 0 and 10.67-BAUD when IC10, pin 5 is logic 1. I have given typical values, however modifying this one is a bit tricky. If  $R_A = R_B < 50 \text{ k}\Omega$  then  $R_C = 4.7 \text{ k}\Omega$  and C can be selected to give the proper frequency.  $F(\text{in Hertz}) = 77/C(\text{in } \mu\text{f})$ , when  $R_A = R_B = 10 \text{ k}\Omega$  and IC10, pin 5 is logic 0. If selecting capacitors is not to your liking try replacing  $R_C$  with a  $20 \text{ k}\Omega$  trimpot in series with a  $1.5 \text{ k}\Omega$  resistor,  $R_B$  with a  $100 \text{ k}\Omega$  trimpot and make  $C = .01 \mu\text{f}$ .

### How to Heat Sink without being burnt

From time to time it seems that we get involved in heat sinking transistors and integrated circuits, like it or not. Unfortunately there is little understanding of how to properly accomplish this job. A client of mine, that should have known better, told me once that it was too bad that there existed no simple key to heat sinking like Ohm's Law.

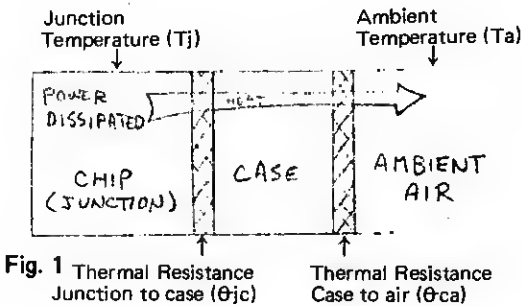


Fig. 1 Thermal Resistance Junction to case ( $\theta_{jc}$ ) Case to air ( $\theta_{ca}$ )

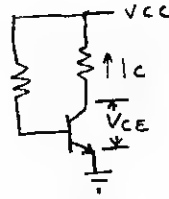


Fig. 2

Actually there is a simple key, Let's look at Fig. 1. Basically heat is generated in a chip when current passes through it. This heat is the direct result of the power dissipation (PD). In Fig. 2  $PD \approx V_{ce} \cdot I_c$ . PD is commonly expressed in watts. It is important to note that all this power is dissipated in the form of heat, 1 watt = 3.412 BTU/hour. At any rate the heat generated, equivalent to PD, must be conducted away from the chip or the junction temperature ( $T_j$ ) will rise until the chip is destroyed. This heat must pass from the chip to the case and from the case to the outside air. The quality of the materials that impede this flow is called thermal resistance ( $\theta$ ). The total  $\theta$  in a system is the sum of all individual thermal resistances. When using a heat sink, see Fig. 3,  $\theta_{ca}$  is reduced because a heat sink can radiate heat much more efficiently than the case of a device. The flow of heat in a system is proportional to the thermal resistance. Since the heat generated is that which flows, we represent the flow of heat by PD. We now have  $PD = \text{temp. drop} / \theta$ . Not only is the key simple, it is exactly like Ohm's Law!

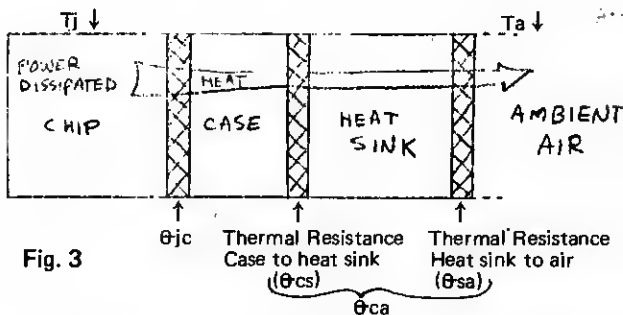


Fig. 3

Returning to Fig. 2, let's suppose we have a 2N3055 whose relevant characteristics are listed in Fig. 4, what is its  $PD_{max}$  without a heat sink?  $PD_{max} = (T_{jmax} - T_{amax}) / \theta_{ja}$ ; for this we will assume  $T_a = 40^\circ \text{C}$ ,  $\theta_{ja} = \theta_{jc} + \theta_{ca}$ . From Fig. 5  $\theta_{ca} = 32^\circ \text{C/W}$ . Hence  $PD_{max} = (200 - 40) / (1.5 + 32) = 4.8 \text{ watts}$ . Occasionally  $\theta_{jc}$  is not supplied, if it is not,  $PD_{max} @ T_a$  will be listed as in Fig. 5. To calculate  $\theta_{jc}$  one must assume a perfect heat sink,  $\theta_{cs} + \theta_{sa} = 0$ , in order to achieve  $PD_{max}$ .  $\theta_{jc} = (T_{jmax} - T_a) / PD_{max} = (200 - 25) / 117 = 1.496^\circ \text{C/W}$ .

$PD_{max} @ 25^\circ \text{C} = 117 \text{ watts}$   
Case style = TO-3  
 $T_{jmax} = 200^\circ \text{C}$   
 $\theta_{jc} = 1.5^\circ \text{C/W}$

Fig. 4

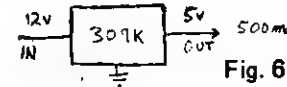


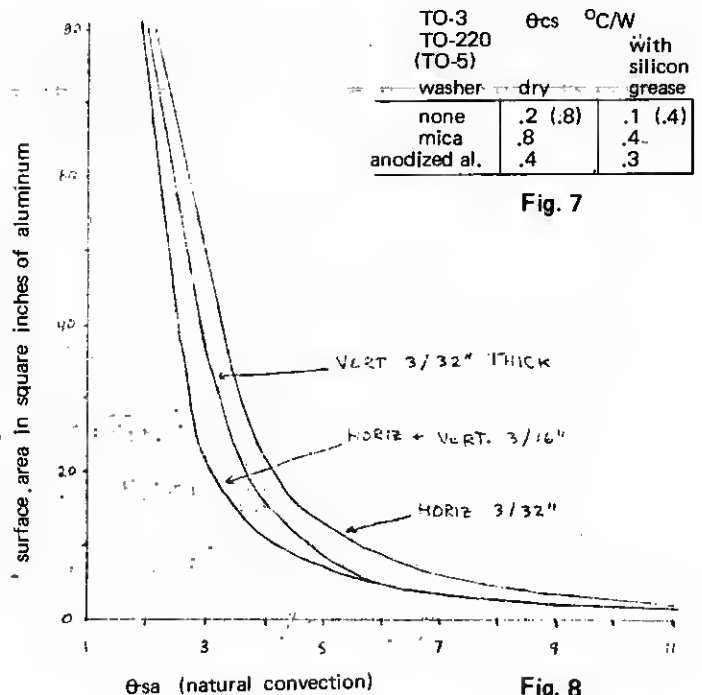
Fig. 6

Case style	$\theta_{ca}$ (natural convection)
TO-3	32°C/W
TO-220	46°C/W
TO-39	130°C/W
TO-5	160°C/W
TO-8	93°C/W
TO-18	250°C/W
TO-66	40°C/W

Fig. 5

Suppose now we take an IC regulator, LM309K. From National Semi's data sheet the case is TO-3,  $\theta_{jc} = 3.0^\circ \text{C/W}$  and  $T_{jmax} = 125^\circ \text{C}$ . It should be noted that  $\theta_{jc}$  cannot be calculated from  $PD_{max}$  because for most IC regulators,  $PD_{max}$  is internally limited to a figure less than the theoretical maximum. For the circuit shown in Fig. 6  $PD = .5(12 - 5) = 3.5 \text{ watts}$ . Assume a  $T_{amax} = 55^\circ \text{C}$ .  $\theta_{jamax} = (125 - 55) / 3.5 = 20^\circ \text{C/W}$ . One would need a heat sink because without one  $\theta_{ja} = 35^\circ \text{C/W}$  which is too large. In order for this circuit to operate properly a heat sink with a  $\theta_{ca} < 17^\circ \text{C/W}$  is required. Commercial heat sinks are well documented. An IERC # LAT03 heat sink has a  $\theta_{sa} = 10^\circ \text{C/W}$  (natural convection). We know everything except  $\theta_{cs}$ ; Fig. 7 lists typical values. Using the Above mentioned heat sink,  $\theta_{ja}$  for the IC regulator would equal  $13.5^\circ \text{C/W}$ , which is adequate since it is less than  $\theta_{jamax}$  calculated above. This is all well and good you may say but the chasis which you intend to use didn't come with a thermal resistance stamped on it. For such problems I have provided Fig. 8. If the regulator discussed above is to be mounted on the back side of a 3/16" aluminium chasis, the minimum exposed area should be 2sq. in.

This is about it, although there is much more detail possible, I believe this approach should keep all stray fusings at bay.



CLUB NOTES - FROM GORDON FRENCH

JUDGING FROM THE SHOW OF HANDS THERE ARE ABOUT A DOZEN ALTAIR'S IN SOME STAGE OF COMPLETION IN THE CLUB. JUST THIS EVENING I GOT A CALL FROM ONE OF MY CRONIES WHO ORDERED HIS INTERFACE WITH HIS ALTAIR AND ALTHOUGH HE HAS HIS MACHINE, THE I/O BOARD IS STILL TO COME. AND SINCE FRED WANTED ME TO DO A LITTLE PIECE, I THOUGHT ABOUT THE RANDOM NUMBER GENERATOR THAT WAS PUBLISHED IN THE COMPUTER HOBBYIST THIS LAST ISSUE. WHEN YOU TIRE OF LISTENING TO FOOL ON THE HILL YOU MIGHT TRY TO MESS AROUND WITH THIS. FOR THE 8008 FAITHFUL I WILL GIVE A PARRALLEL LISTING. YOU WILL CALL THIS AS A SUBROUTINE.

JIM PARKER'S RANDOM NUMBER GENERATOR ROUTINE  
FROM "THE COMPUTER HOBBYIST" (VOL.1 NUMBER 5)

8080

```
000100/ 041 LXI, SHIFT+3
000101/ 146
000102/ 000

000103/ 006 MVI,B,8
000104/ 010
000105/ 176 MOV A,M
000106/ 007 RLC (TAG-RTOP)
000107/ 007 RLC
000110/ 007 RLC
000111/ 256 XRA,M
000112/ 027 RAL
000113/ 027 RAL
000114/ 055 DCR,L
000115/ 055 DCR,L
000116/ 055 DCR,L
000117/ 176 MOV A,M
000120/ 027 RAL
000121/ 167 MOV M,A
000122/ 054 INR,L
000123/ 176 MOV A,M
000124/ 027 RAL
000125/ 167 MOV M,A
000126/ 054 INR,L
000127/ 176 MOV A,M
000130/ 027 RAL
000131/ 167 MOV M,A
000132/ 054 INR,L
000133/ 176 MOV A,M
000134/ 027 RAL
000135/ 167 MOV M,A
000136/ 005 DCR,E
000137/ 302 JNZ,RTOP
000140/ 106
000141/ 000
000142/ 311 RET
(TAG THE NEXT LOCATION "SHIFT")
000143/ 123 SET TO ANY VALUE
000144/ 123 SET TO ANY VALUE
000145/ 123 SET TO ANY VALUE
000146/ 123 SET TO ANY VALUE
000146/ 123 SET TO ANY VALUE
```

8008

```
000100/ 056 LHI 000
000101/ 000
000102/ 066 LLI 147 SHIFT+3
000103/ 147
000104/ 016 LRI 010
000105/ 010
000106/ 307 LAM
000107/ 002 RLC
000110/ 002 RLC
000111/ 002 RLC
000112/ 257 XRM
000113/ 022 RAL
000114/ 022 RAL
000115/ 061 DCL
000116/ 061 DCL
000117/ 061 DCL
000120/ 307 LAM
000121/ 022 RAL
000122/ 370 LMA
000123/ 060 INL
000124/ 307 LAM
000125/ 022 RAL
000126/ 370 LMA
000127/ 060 INL
000130/ 307 LAM
000131/ 022 RAL
000132/ 370 LMA
000133/ 060 INL
000134/ 307 LAM
000135/ 022 RAL
000136/ 370 LMA
000137/ 011 DCB
000140/ 110 JFZ 000107
000141/ 107
000142/ 000
000143/ 007 RET

000144/ 123 SET TO ANY VALUE
000145/ 123 SET TO ANY VALUE
000146/ 123 SET TO ANY VALUE
000147/ 123 SET TO ANY VALUE
```

I ENTERED THIS ROUTINE STRAIGHT FROM THE MAGAZINE AND IT WORKS BEAUTIFULLY. "TRY IT YOU'LL LIKE IT". FOR MORE INFORMATION, READ THE ARTICLE THAT THE COMPUTER HOBBYIST PUBLISHED. THEIR ADDRESS IS:

THE COMPUTER HOBBYIST  
BOX 295  
CARY, NC. 27511

I THOUGHT UP MY OWN WAYS TO PLAY WITH THE ROUTINE. TRY SOME OF YOUR OWN. IT'S FUN.

MANY THANKS TO JIM PARKER, FOR A REALLY NEAT GENERATOR THAT WORKS JUST GREAT! THANKS TOO, TO ED HALL WHO CHECKED OUT THE 8080 CODE FOR ME. FOR A BEARDED SOFTWARE MAN, YOU'RE OK, ED!

**Club Treasury Report:**

**INCOME:** We collected \$21.00 May 14 and \$17.00 May 28.  
**Total income:** \$38.00.  
**EXPENSES:** Third newsletter copying cost \$24.00, postage \$12.90. **Total expenses:** \$36.90.  
**OLD BALANCE:** May 14, 1975, \$46.48.  
**NEW BALANCE:** As of June 5, 1975, \$47.48. Cost and mailing of this newsletter has not been deducted. About 200 will be printed and mailed out which will bring the balance close to zero or below. We request a dollar donation from all new attenders of the club. Other donations are most welcome. Also, anyone who has not filled out a Club Survey Questionnaire, please do; this lets the rest of us know you are an active member. We need some good suggestions for raising money for the club besides taxing ourselves.

**NEXT MEETING: WEDNESDAY, JUNE 11**  
7 PM at Stanford Linear Accelerator Center in the Auditorium. Directions: From Freeway 280 take the Sand Hill Road exit east toward Menlo Park. At sign: SLAC, turn right. Auditorium is directly ahead. Parking area to your right. We will meet here every two weeks (June 25, July 9, etc.). I'll send out a post card if there are changes. See you there.

San Francisco - Berkeley Chapter meets June 18 at Lawrence Hall of Science in Berkeley, 7:30 pm.

**Sonoma County Minicomputer Club** meets every Thursday at 7:30 pm at 170 East Cotati Avenue Suite H, in Cotati, Ca. (near Santa Rosa). Meeting place may change so call LOOP Center 707-795-0405 or Mark Robinson, President, at home 707-525-1659 or at work 707-544-2865.

**Solid State Music**  
2102 A Walsh Avenue  
Santa Clara, Ca. 95050  
tel. 408 - 246 - 2707

John Burgoon makes this limited time offer to the club:  
100 2602/2102 for \$200.00 These have been tested to be functionally ok at 500 kilo Hertz with no excessive leakage. Will work in an Altair or Mark-8 type computer.  
Also: 4K memory board bare for \$17  
4K memory board wired and tested \$163.80.  
8 1101 for \$8.00.  
Cyber-comm desk, power supply & card rack \$75.00  
Best prices on TTL, CMOS, MOS, Linears, etc.  
Open 6 pm to 9pm Mon. - Fridays, Sat. 10 - 5.

The Digital Group is sending out a free Flyer which will list current announcements and previews of new products. And the Digital Group Clearinghouse will be putting out a newsletter available for \$6.00 per year (12 issues).  
Contact: The Digital Group P. O. Box 8528  
Denver, Colorado 80206

I got an enthusiastic letter from Carl Helmers announcing a new magazine for the computer experimenter: **BYTE!** An arrangement has been made with Wayne Green who publishes 73 magazine for amateur radio hams to handle the business and copy preparation (8½ x 11 format, glossy paper). The first issue is scheduled to be mailed in mid-July. Subscription rate is \$12.00 for 12 issues (\$10.00 introductory). Inquiry should be directed to: **BYTE! Green Publishing, Inc. Peterborough, N.H. 03458**

The S.F. - Berkeley Chapter of the Homebrew Computer Club met June 4th at the Lawrence Hall of Science in the Berkeley hills. The topic focused on was computer based community memories and how such systems are best used. Discussion and questions located concepts such as: Networks, Rain Forest, Platonic Form, Member/economics, computer utility, distributed memory, interconnecting indices, etc., which may be explored more fully at some future date. Thanks to Lee for initiating the topic and bringing people together on it. Thanks to Pete for making the Hall available to the club.

Altair OS Software needed for building automation applications: disk driver, analog cassette handler, high speed paper tape read/punch, line printer handler. Contact: John Drace Stanford Med. Ctr. 493-7829.

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